Bahria University, Islamabad Campus
Department of Software Engineering
Final Examination
Class/Section: BSE-1 (A)
(Fall 2022 semester)
Paper Type: Descriptive

Subject:	**Computer Programming**	Date: 23-01-23
Course Code:	CSC-113	Time: SESSION-I
Name of Faculty:	Dr. Raja M. Suleman	Max Marks: 50
Time Allowed:	150 minutes	Total Pages: 4 (including this)

INSTRUCTIONS:

I.   Write name and enrollment numbers on top of the question paper.
II. All questions are compulsory.
III. There are total of 4 questions.
IV. The paper is closed book.
V.   The students are not allowed any helping material (books, tables, formulas, etc.)
VI. Use blue, black or blue-black ink only. Do NOT use lead pencil especially.
VII. **It is mandatory to RETURN the Question Paper, otherwise marks will be deducted.**

Q. 1) [CLO-1]   **[10 marks]**

i.   What are Functions in C++. How are they useful?
ii. Differentiate between Actual and Formal Parameters in a Function.
iii. What is the difference between Passing by Value and Passing by Reference in a Function?
iv. What are Arrays, and why are they useful?
v.   What are **const** Formal Parameters?
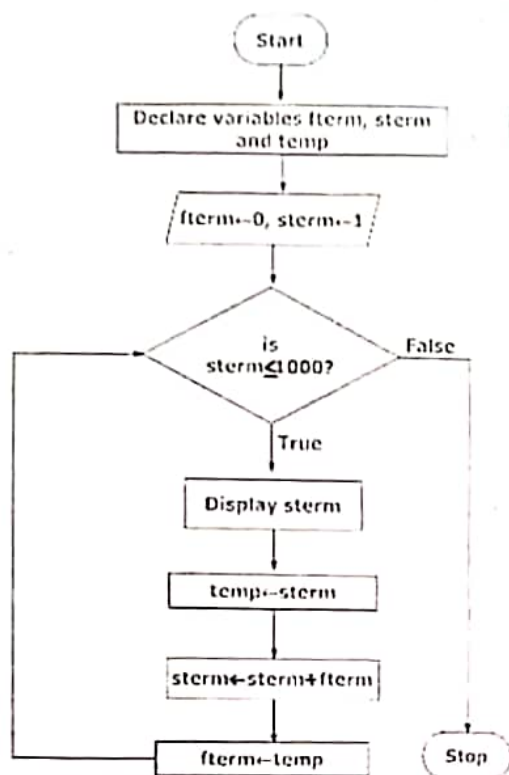
Q. 2) [CLO-2]   **[10 marks]**

Analyze the following Flowcharts in Figure 1 and Figure 2 and write the corresponding C++ codes for each: **(5 marks each)**

The ← denotes assignment operator

Figure2. Flowchart 1
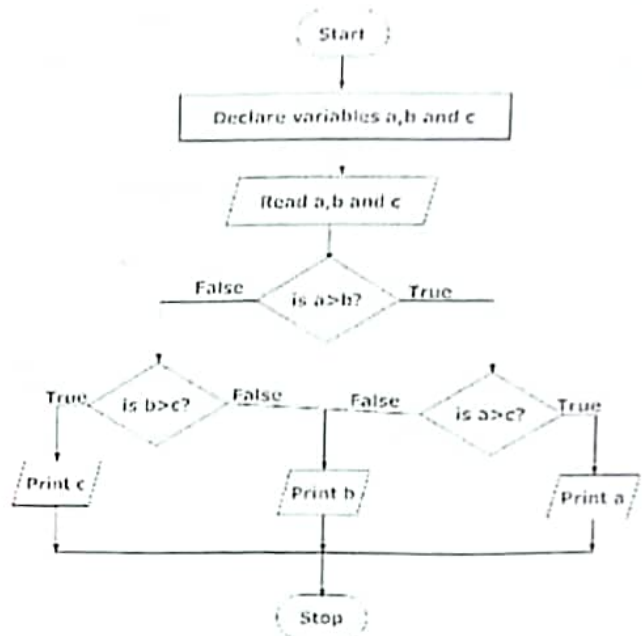

Figure2. Flowchart 2

Q. 3) [CLO-3]   [10 marks]

1. Write a C++ function that takes in a string and a character, and returns the number of occurrences of the character in the string. (2 marks)
2. Write a function that takes in a string and returns a new string with all the characters in odd positions (first, third, fifth, etc.) removed. (2 marks)
3. Write a function that takes in two strings and returns true if they are anagrams (contain the same letters), and false otherwise. (2 marks)
4. Write a function that takes in a string and returns true if it is a palindrome. A palindrome is a string that reads the same backward or forward, for example, the string "WAS IT A CAR OR A CAT I SAW" should be considered a palindrome. Assume all letters are uppercase. (4 marks)

Q. 4) [CLO-3]   [20 marks]

For this question, imagine you're developing a Console-based Battleships Game. A Battleships game is a 2-player game with a 10x10 grid for each player. The player arranges their ships on their grid like Figure 3. They have a total of 5 ships with the sizes as shown in Table 1.
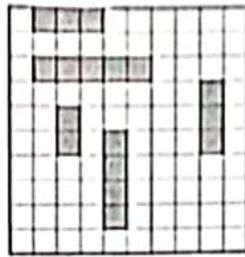
Figure3. A sample placement of ships for one player

*The ships can only be placed vertically or horizontally, i.e. the player can't place their ship on a diagonal.

Table1. Battle Ship Sizes

No.	Class of ship	Size
1	Carrier	5
2	Battleship	4
3	Destroyer	3
4	Submarine	3
5	Patrol Boat	2

After the ships have been positioned, the game proceeds in a series of rounds. In each round, each player takes a turn to select a target square (x,y) coordinate on the opponent's grid which is to be shot at. The opponent announces whether or not the square is occupied by a ship. If it is a "hit", otherwise it is a "miss".

When all of the squares of a ship have been hit (size of ship), the ship is sunk and a message is provided to the players. If all of a player's ships have been sunk, the game is over and their opponent wins. If both players run out of ammo (maximum number of tries), the game is a draw.

Your task is to write the logic for the following functions for the above game:

1. **void InitializeBoard(int grid[][10], MAX_ROWS):** This function will allow each player to place their ships on their grid. The function will ask the coordinates (rows, cols) from the user according to the ship sizes and save them in the grid. **(5 marks)**

2. **void GetMissileCoords(int &x, int&y):** This functions will prompt user to input their coordinates (x,y) where they want to fire a missile on the opponents' grid. **(2 marks)**

3. **bool CheckHit(int grid[][10],MAX_ROWS, int x, int y):** This function checks whether there is a ship present on the supplied x, y coordinates. If there is a ship present, the function: **(5 marks)**

   a. checks whether a full ship has been hit, in which case it displays a message: "ship sunk",
   b. updates the grid with a HIT and

   c.   returns True, otherwise it returns False.

4. **void UpdateScores(int scores[2][1], int player_num):** This function updates the scores of each player based on the results of the CheckHit() function. player_num=0 corresponds to Player-1 and player_num=1 corresponds to Player-2. If a player's score is equal to 17, they have sunk all of their opponents ships. **(4 marks)**

5. **int main():** The main function that will make use of all of the above functions to run this game. You can set your own MAX_NUM_TRIES value for all players. **(4 marks)**